THE RESPONSE IN THE HUMAN MASTICATORY SYSTEM TO THE SUDDEN UNLOADING OF THE JAW CLOSING MUSCLES

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SUMMARY

When the resistance to forceful jaw closing is suddenly and unexpectedly withdrawn, the closing movement of the mandible is usually arrested before the teeth come together. An "unloading reflex" has been previously described in jaw and limb muscles where agonist inhibition and antagonist activation have been presented as a feature of this restriction of movement.

In this present study, the unloading reflex in the jaw closing muscles in man was investigated with a view to correlating the jaw closing movement with the timing of the electrical activity in the agonist and antagonist muscles. The behaviour of these muscles was studied as the force and the joint angle at the time of unloading were varied.

The results generally agree with earlier studies in that there was a similar pattern of reflex inhibition of elevator muscles and activation of the digastric muscle after unloading. However, this pattern does not adequately account for the rapid arrest of the jaw closing movement as deceleration of the mandible always started within 5 msec of unloading while the elevator muscles were still active, and well before the depressor muscles were activated. This suggested that a mechanism was acting to limit the upward movement of the mandible at a shorter-latency than could be explained by a reflexly-induced load compensation mechanism.

It was concluded that the mechanism principally responsible for the limitation of the jaw closing mechanism was a pre-programmed increase in the stiffness of the digastric muscle which opposed the movement.

This mechanism consisted of co-contraction of both the elevator and depressor muscles as the subjects attempted to overcome the resistance between their teeth.

It is proposed that at least two mechanisms exist to limit the movement around a joint after the resistance to an isometric agonist contraction is overcome. The slower reflexly-induced mechanism described in previous studies may be augmented by this rapidly acting feed forward mechanism when it is important to restrict the amount of limb movement.

Evidence of the co-contraction of digastric and elevator muscles and increased digastric activity when unloading occurs at low openings and high forces is presented in support of this pre-programmed control of jaw movement by antagonist muscle stiffness.

SIGNED STATEMENT

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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